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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XIX October 1, 1935 Number 16

TOBACCO DISEASE OBSERVATIONS IN KENTUCKY

W. D. Valleau and E. M. Johnson

Between August 20 and 29, 1935, twenty-nine fields of dark fire-cured tobacco were examined in Todd and Logan Counties, Kentucky, about 325 acres. Wildfire (Bacterium tabacum) was found in twenty-three fields, and angular leaf spot (B. angulatum) in twenty-nine. This is the first year that wildfire has been found in this and neighboring counties. In certain sections of these two counties, rainfall was heavy and frequent throughout the growing season. This was especially true of the area around Elkton and Allensville. In these two areas, injury from these two diseases was great. In ten fields the growers were forced to cut immature tobacco to prevent complete loss. In two fields--one of 10 acres and one of 8--both infertile, about a third of the tobacco was injured too badly to cut. In the drier areas, both diseases were present, but were not causing severe injury. The greater loss occurred on low-lying areas where water may have stood for some time following heavy rains, and where the leaves remained wet from dew well into the day. In the areas of heavy rainfall, plants on higher ground were infected on the lower leaves, but for the most part the damage was rarely great, except in badly eroded areas. At the time of inspection, all the plants had been topped for three to six weeks, and most of them had been suckered twice. Immature plants in nearly all fields were usually free

of disease. In some instances, wildfire could be traced to the plant bed. Five fields of One Sucker in Todd County all had wildfire and angular leaf spot injury as in the dark fired varieties.

Of five Burley fields examined two had wildfire and angular leaf spot; one, angular leaf spot only, and two appeared free. Neither wildfire nor angular leaf spot appeared to be causing any damage. Frogeye (Cercospora nicotianae) was present in all Burley plantings--usually half way up plants, and in one field to the top of plants. Burley is usually topped late and high and suckers are allowed to grow to large size, while dark fired tobacco is topped early and low and kept closely suckered.

Eighty-two leaves were collected at random from plants in most of the fields examined. These were kept in the laboratory for two to three weeks, when bits of affected tissue were put in broth overnight and inoculations made, with an atomizer, to Burley plants in the field. Seventy-five cases of angular leaf spot and fifty-two of wildfire resulted. On Burley tobacco large concentric spots were produced with pure cultures of B. angulatum and with cultures directly from leaf spots. This appears to be the first report of production of these spots by inoculation.

At the Princeton Experiment Substation, where records of disease have been kept for several years, the latter part of the summer was dry, and leaf spots scarce. From a few spots collected, both wildfire and angular leaf spot resulted in subsequent inoculation tests. Wildfire has not previously been observed on this farm or, in fact, in that part of the State. All precautions, including seed treatment, clean canvas, Bordeaux spray, etc., had been taken to prevent plant-bed infection. The beds appeared clean. At Lexington a single wildfire spot was found in the plant bed July 5 about one week after setting was complete. Inoculations in the greenhouse gave typical wildfire. The sudden appearance of wildfire here and in several other parts of the State where it has never previously been reported is difficult to explain. It seems probable that it was not due to sudden spread from infested areas.

Black root rot (Thielavia basicola) was found in two fields in Todd County which had previously been limed. In one field of One Sucker, White Burley, and dark fired tobacco the reduction in yield was fully 50 per cent. The field had been limed and the plant bed used for eight successive years, being heavily infested with the black root fungus. The report by Paul R. Miller, (P.D.R. XIX, No. 15, p.239) that "black root rot was found generally in all fields (in the Greeneville section of Tennessee), even though the growers are resorting in many cases to resistant strains" perhaps needs amplification. Much of the seed used in that section originates in Kentucky and is of the Judy's Pride variety. This variety is sold under the claim that it

is resistant, but it is in fact highly susceptible to black root rot. The growers are still ignorant of this fact. In our experience this year, Kentucky White Burley No. 5, while showing slight injury early in the season, was sufficiently resistant so that root rot injury would not have been evident in August.

Hollow stalk (soft rot bacteria) was observed in about ten plants in one corner of a field of dark tobacco in Todd County. In a field of Burley in Nicholas County being saved for seed, about 2 per cent of the stalks were rotting, infection evidently having occurred where lower flowering branches had been broken off.

Nematodes were found on a small planting of Burley tobacco in a garden in Lewisberg, Mason County.

Black shank? Two fields of dark tobacco were found in Todd County which appeared to be affected with black shank (Phytophthora nicotianae). In one, about fifty plants had died; and in the other the grower estimated that between 500 and 1,000 plants had died this year. Both fields were in tobacco last year when the plants died. In one of the plants examined a large-diameter, non-septate fungus was present in the pith. This was readily isolated and appears to be a Phytophthora. The other plants examined were too old for successful isolation.

Mosaic burn was present in some fields in Todd County, causing rather extensive injury to the uppermost valuable leaves. In other fields mosaic was equally prevalent, but burning was absent. This is in keeping with our findings that only certain strains of the mosaic virus cause burning. Mosaic was more prevalent in Kentucky this year, perhaps due to abnormally heavy rainfall, which necessitated working in tobacco more while wet. Tobacco handled while wet is much more likely to contract mosaic than when dry.

Fusarium wilt (F. nicotianae) caused but slight injury to highly susceptible varieties of Burley tobacco inoculated at setting time by dipping roots in a spore suspension (a method which in previous years resulted in 100 per cent loss in 10 days) possibly due to cool, wet weather which followed. However, more reports of wilt were received this year than in previous years. It occurs principally in sandy soils. A variety of White Burley about 75 per cent resistant when inoculated is being sent to growers who report having the disease.

Frenching (non-par.) has been rather more prevalent than usual this year, occurring in limed soils or soils with similar reaction. It was found in tobacco in Nicholas County on land where limestone is found scattered over the surface. Previously it had been thought not to occur on such soils. On the Campbellsville soil field it was present in the lime-phosphorus plot, but not in the lime-phosphorus-potassium plot, although in previous wet years it had occurred on both plots.

REPORT ON COTTON DISEASES IN GEORGIA

J. H. Miller

Seedling-blight or dwarfing (Fusarium moniliforme): In Screven and Effingham Counties 4,000 bushels of Dixie Triumph seed were introduced from South Carolina. Some of it was planted about the middle of March, and by April 10 had germinated and died with a root-rot. Later plantings from the same seed lot on April 1 and April 15 also germinated and died to the extent of about 25 to 90 per cent of the stand.

In Hancock County the same disease was introduced from South Carolina on Farm Relief cotton. The loss of stand on one farm was complete and the field was plowed up and replanted.

A survey was made in north Georgia in Clarke, Oconee, Oglethorpe, and Jackson Counties. The disease was found in all cotton fields planted with seed brought in either this year or last year. Here also it was introduced on Farm Relief cotton, from the same source as above. The loss of stand in the inspected fields ran from about 6 to 70 per cent. It was just as heavy on red Cecil clays as on light sandy loams. Other varieties, and even fields of the same variety where the seed had been grown locally for several years, did not have the blight. Growers had not noticed the disease prior to the last two years.

Repeated inspections throughout the summer have shown that if plants survive the first seedling attack they will either make dwarfed, unprofitable plants, or continue in an apparently normal condition. However, all plants in fields that had much early disease have injured root systems now. The majority have no tap root, and many have no roots on one side, and a continual dying of very small roots is still going on.

It is difficult to estimate the loss, since at picking time infected plants appear to be normal and there is no actual dying. From this season's observations the extent of injury seems to be dependent on the amount and distribution of rainfall, and to some extent on fertilization. This was seen when a short dry period of about two weeks in early August injured infested fields much more than others. One thirty-acre field of high fertility near Athens lost about 20 per cent of the stand in the late spring and in September the roots of survivors are all infected but there has been no dying since early June. The yield is about one-half bale to the acre, which is about 50 per cent reduction from the expected yield. Other infested fields have shown much less reduction.

Sore shin (Rhizoctonia sp.). In fields not infested with Fusarium moniliforme a trace of seedling dying was found this year. Most of this was due to a Rhizoctonia, but occasional plants died from Sclerotium rolfsii.

Cotton-wilt (Fusariumvasinfectum). The incidence of this disease has been increasing steadily in north Georgia in recent years. In one field of about 40 acres in Walton County, 15 to 20 per cent of the plants died this year. The nematode root-knot (Heterodera marioni) was present on most plants examined. Two varieties were planted, Farm Relief No. 1 and No. 2. Inspection was made in August. A three-year rotation had been practiced. The previous year it had been in Iron cowpeas, and before that in corn. The farmer stated that he never had this much wilt on his farm before.

A cotton fertilizer and rotation experiment, conducted by Prof. R. R. Childs of the College of Agriculture at Athens, on land thoroughly infested with this Fusarium, shows a striking effect of potash in control, reported in table 13. The variety used is College No. 1, a susceptible variety, and the soil is a rather stiff red clay. Inspection was made September 16 after most of the cotton had been picked

There are three rectangles, one lying below the other, and a rotation of cotton, corn, and cowpeas is followed. The same fertilizer test has been applied each year, but the sequence starts at different ends of the plots. The plots contain five rows each.

TABLE 13. Effect of different fertilizer treatments on the incidence of cotton wilt, at Athens, Georgia.

Plot no.	Plot treatment and rate per acre	Percentage of wilted plants
1	No fertilizer (check)	10.
2	50 lbs. muriate of potash	0.1
3	300 " superphosphate	90.
4	100 " sulphate of ammonia 100 " limestone	90.
5	50 " muriate of potash 300 " superphosphate	0.1
6	50 " muriate of potash 100 " limestone 100 " sulphate of ammonia	10. (all in last row)
7	300 " superphosphate 100 " sulphate of ammonia 100 " limestone	90.
8	50 " muriate of potash 300 " superphosphate 100 " limestone 100 " sulphate of ammonia	5. (all in last row)

Plot no.	Plot treatment and rate per acre	Percentage of wilted plants
9	3,000 lbs. rock phosphate, once in three years	85.
10	3,000 lbs. rock phosphate once in three years 50 lbs. muriate of potash	0.1

The plots listed in the table comprise one-half of the field. The other half contains the replications, and shows the same four wilt spots following the same fertilizers (plots 3, 4, 7, 9). Most of the plants attacked died in August and early September and produced no cotton.

Wilt spots following the same fertilizers have appeared regularly for several years, in the other two rotation plots as well as in the one reported this year.

Cotton rust (various causes). Rust spots have been found this year in Walton, Oconee, Clarke, and Madison Counties. In all cases they were on poor, gray land. The leaves had a yellowish mottled appearance and were shed prematurely. The roots were not noticeably affected. There is always some loss from this trouble in this section.

Cotton stem blight (Macrophoma sp.). Diseased stalks were sent to the writer from near Tifton. The cotton was one to two feet high and much of it was dying in the field. The lower stem contained black cankers studded with pycnidia of a Macrophoma. Death resulted when the stem was girdled. The fungus is similar to Macrophoma phaseoli on bean stems, also occurring in this locality.

CEPHALOBUS ASSOCIATED WITH A PEANUT DISEASE

Cephalobus elongatus de Man. was found in peanut plants showing a witches' broom effect in the tops, sent from Tennessee to Dr. G. Steiner by Paul R. Miller.

DOWNY MILDEW OF ONION IN CALIFORNIA

Downy mildew (Peronospora destructor) was severe in all onion fields examined in Sonoma, Contra Costa, Yolo, Sacramento, Santa Clara, and Stanislaus counties and was reported severe in Kern and Orange counties. The greatest damage was to the seed crop in which 100 per

cent of the plants were frequently infected and yields were probably reduced 50 per cent or more in some cases. The causative fungus is known to overwinter in infected bulbs and rapid dissemination by wind has been apparent. In one Sonoma County seed field the disease was active from about March 27 to May 29. Attempted control with fungicidal sprays has in general given unsatisfactory results, but in one single row test weekly applications from April 3 to May 15 of .25 per cent cuprous oxide with 1 per cent rosin soap spread well on the leaves and seed stalks and increased the number of producing seed stalks by about 40 per cent. (Cecil Yarwood, Sept. 16.)

SOME REPORTS ON DISEASES OF VEGETABLE CROPS

SWEET POTATO STEM ROT IN TENNESSEE: In 1934 a survey was made of the diseases of sweet potatoes in Weakley County, Tennessee (P.D.R. XVIII, Nos. 8 and 13). In extensive field counts it was found that the loss from stem rot (Fusarium oxysporum) ranged from 2 per cent to 65 per cent with an average of about 25 per cent. This region, including fields of most of the same growers, was surveyed last week. The amount of loss varied from 0.5 per cent to 65 per cent with an average of approximately 5 per cent. The abnormally dry season of last year was considered to be favorable for stem rot development. The past season has been very much like that of 1934, as shown by comparative weather records kept in that region. The material reduction in the amount of the disease this year as compared with the same region last year may be attributed, to a great extent, to the intensive demonstration and extensive educational program on its control carried out in Weakley County by G. M. Stone, Assistant Plant Pathologist of the Agricultural Experiment Station, University of Tennessee. One striking example may be cited: Two neighbors bedded potatoes taken from the same lot of seed. One chose a new location for his bed, selected the seed carefully and treated it with corrosive sublimate, and his field showed less than 1 per cent stem rot; whereas the other grower did not observe any of the control measures and had about 65 per cent of his plants infected. (Paul R. Miller, Sept. 21)

LEAF SPOT OF SALSIFY IN NEW YORK: A leaf spot or blight of salsify, var. Sandwich Island, caused by Sporodesmium scorzonerae Aderh. was found on August 10 in two beds of salsify on two vegetable farms on Staten Island. Approximately 30 per cent of the leaves on the affected plants were severely spotted, the plants being about two-thirds grown. This disease had been found previously on one of these two farms in the late summer of 1933. Partly on account of a secondary invasion by a soft-rot organism the crop at that time was a total loss.

Since neither of these nor adjacent beds have had salsify on them for four or more years, the indications are that the pathogen may be seed-borne. (M. B. Linn.)

CEREAL DISEASES IN WYOMING

G. H. Starr

Black stem rust (Puccinia graminis) has been very prevalent on oats, wheat, and barley grown at the Agronomy Farm, Laramie, Wyoming, the past season. Wheat has suffered most, barley somewhat less, and oats least of the three cereals.

On July 23, several varieties of oats, wheat, and barley were examined for the presence of rust. No rust was found at this time on the oats and only a slight amount was evident on the wheat and barley. This averaged about one pustule per plant. On August 26, a rust inspection was again made on the same plots as before. At this time rust was very abundant, especially on the wheat and barley. The following summary shows the average severity and prevalence of rust on the various varieties of cereals examined:

Wheat

No rust on Hope and H-44
25 per cent on 100 per cent or less, Spelmar, Acme and Bunyip.
60 per cent on 100 per cent or less, Kubanka, Ceres, Federation, Dicklow, Marquillo and Garnet.
80 per cent on 100 per cent or less, Marquis, Kota, Baart and Bluestem.

Barley

Trace to 20 per cent on 100 per cent or less, Colcess, Trebi, Spartan and Hannchen.
Trace to 60 per cent on 100 per cent or less, Comfort, Vaughan and Charlottown.
5 to 60 per cent on 100 per cent or less, Glabron, Smyrna, O.A.C. #21, and Odessa.
20 to 80 per cent or less, Flynn, Horn, Manchuria, Beldigiant and Coast.

Oats

None on Iogold
Trace to 5 per cent on 50 per cent or less, Swedish Select, Silvermine, Idamine, Banner, Lincoln, and Anthony.
Trace to 20 per cent on 100 per cent or less, Iogren, Abundance, Tartar, King, Corriente and Kherson.
Trace to 60 per cent on 100 per cent or less, Markton, Victory and Colorado 37.

Wheat bunt (Tilletia sp.) was very prevalent this year on non-treated plots of certain varieties grown in drilled plots about six feet wide. The relative abundance of bunt may be seen from the following data:

Variety	Per cent bunt	Variety	Per cent bunt
Dicklow	90	Ceres	5
Acme	50	Federation	trace
Kota	25	Marquis	none
Kubanka	20	Marquillo	none
Bluestem	15	Hope	none
Spelmar	12	H-44	none
Baart	8	Garnet	none
Reliance	8	Bunyip	none

This evidently has been a very favorable season for bunt infection and development. (Wyoming Agr. Exp. Sta., Sept. 17).

SOYBEAN DOWNY MILDEW IN ILLINOIS

G. H. Boewe

Downy mildew, Peronospora manshurica (Naoumoff) Sydow, first reported in Illinois in 1929, and since not often recorded, has assumed considerable importance this year. In our survey of soybean diseases in the southern two-thirds of the State, we have found downy mildew widely prevalent. In addition to the counties listed in the table, fifteen fields in Richland, Saline, Massac, Pulaski, and Jefferson counties were examined, and the disease was found present in all of them.

The accompanying table (Table 14) gives actual counts of downy mildew infection made in ten fields and shows the average number of leaves infected. The leaf infection ranged from a single spot on a few leaves to almost complete involvement of some leaves. In general about 10 per cent of the leaf area appeared destroyed by the fungus. No doubt the unusually heavy rainfall until about the middle of June influenced the amount of mildew infection.

TABLE 14. Incidence of downy mildew (Peronospora manshurica) on soybean in Illinois in 1935.

County	Variety	Percentage of plants with infection	Percentage of leaves infected on diseased plants	Average percentage of leaves infected in field
Champaign	?	100.0	54.0	54.0
Champaign	?	100.0	95.5	95.5
Cumberland	Virginia	85.0	40.0	34.0
Edwards	Virginia	100.0	71.1	71.1
Edwards	Virginia	0.0	0.0	0.0
Jasper	Illini	92.2	68.2	62.88
Jasper	Virginia	100.0	42.3	42.3
Johnson	Virginia	100.0	41.8	41.8
Union	Virginia	78.0	30.2	23.56
White	Virginia	100.0	56.6	56.6

(Illinois State Natural History Survey).

QUINCE RUST ON APPLES IN TENNESSEE

In June of this year quince rust (Gymnosporangium clavipes) was found on approximately 40 per cent of the fruit of Stayman and Red Delicious apples in an orchard in West Tennessee (Reporter XIX, no. 9, p. 139). Last week the fruit was being harvested in this orchard and an excellent opportunity was thus afforded to estimate the amount of disease on the ripened apples. Counts of the apples from several trees showed that only 5 per cent were infected, Apparently much of the infected fruit had dropped before maturity. (Paul R. Miller, Sept. 21.)

NEEDLE DISEASE OF WHITE FIR IN CALIFORNIA

The death of foliage of white fir (Abies concolor) from Hypodermella abietis-concoloris has been much more widespread this year than usual in the central Sierra Nevada region of California. In some areas practically all of the 1934 needles on the younger trees have been killed. Attacks by this fungus in the region are ordinarily confined to scattering individual young trees or groups of saplings and a general attack of the sort occurring this season has not been observed for a number of years. (Willis W. Wagener, Sept. 18.)

FOREST SEED BED DISEASES IN GEORGIA AND SOUTH CAROLINA

J. H. Miller

Damping-off and seedling root-rot (Fusarium sp.): Seedling dying was first noticed in May in the Forest School nurseries and the U. S. Soil Conservation nurseries in Clarke County, Georgia. Slash, longleaf, and loblolly pines and black locust were attacked. The roots showed black lesions and died into the cambium, and when plated out a species of Fusarium appeared from all of them. In September this dying has stopped but there are yellow spots in the beds and these show Fusarium infected roots. The loss has been: in loblolly pine 10 to 30 per cent, in slash pine 15 to 75 per cent, in longleaf pine 5 to 15 per cent, and in black locust 10 to 40 per cent of the stand.

This same Fusarium was found on dying slash pine sent in from the U. S. Soil Conservation nurseries at Spartanburg and Rock Hill, South Carolina. The losses there were about the same as at Athens, Georgia. In one instance near Spartanburg, yellow, unthrifty young pines, among others set in the field this past spring continued dying. The field stand was reduced to 72 per cent.

Black walnut seedlings, one to two feet high, in nursery rows at LaGrange, Georgia, and at Spartanburg, South Carolina, died with a loss of 20 to 50 per cent. The roots died as with the pines and the same Fusarium was recovered from cultures.

Black locust leaf spot (Macrosporium sp.): In September a spotting shows on about 40 to 70 per cent of the leaves in the seed beds at Athens, Georgia. This is defoliating all of the lower leaves, but has little effect on the upper ones. The field of beds presents a yellow appearance. This disease appeared in early August.

DYING OF LOMBARDY POPLARS IN TENNESSEE

Last week many Lombardy poplars in various West Tennessee towns were observed to be dying or dead. The dying seems to start in the tops of the trees. Bacteria have been isolated frequently from the diseased trees. (Paul R. Miller, Sept. 21.)

DUTCH ELM DISEASE ERADICATION

(From reports of the Bureau of Entomology and Plant Quarantine, for the weeks ending Sept. 14 and Sept. 21)

During the period a tree at Portsmouth, Virginia, was found to be infected with Dutch elm disease. A diseased tree near Craigville in Orange County, New York, extended the area of infection in that State.

The number of confirmed and eradicated trees up to September 21 is as follows:

	Confirmed	Removed
Connecticut		
September 8 to 21	11	11
Total up to September 21	131	126
New Jersey		
September 8 to 21	432	1,000
Total up to September 21	8,613	8,062
New York		
September 8 to 21	81	401
Total up to September 21	4,644	4,517
Other		
September 8 to 21	1	3
Total up to September 21	15	14
Totals		
September 8 to 21	525	1,415
Total up to September 21	13,403	12,719

A PLANT DISEASE SURVEY OF TREES AND SHRUBS IN WESTERN MASSACHUSETTS

W. H. Davis

A survey of the most important diseases of trees and shrubs has been under way since the first appearance of the Dutch Elm Disease in the United States. Special attention was given elms for the specific purpose of detecting the Dutch elm disease at once if it was present in Massachusetts, but other forest and shade trees and shrubs were included in the survey. Only the noteworthy diseases and injuries are included in this report. In July 1935, the survey was continued but under a new management and as a C.W.A. project. The writer, however, wishes to make available some results obtained in the voluntary survey of diseases of shade and forest trees, shrubs, and some vines.

The Dutch elm disease organism was not located although, in one year, cultures were made from 348 collections obtained by tree wardens, the writer and others interested in detecting the organism. Not a single culture was certified as Ceratostomella ulmi by the Dutch Elm Disease Laboratory at Morristown, New Jersey, where suspicious cultures were sent for verification. The main contribution was in preventing unscrupulous individuals from insisting that trees on college campuses, estates, and parks were infected by the Dutch elm disease organism and their services were required, at once, to

remove the elms or spray the trees. Only one case was reported where these "bootleg tree experts" duped patrons before their scheme was detected.

TREES

ELM: ULMUS SPP. Verticillium sp. Verticilium wilt. In general, trees attacked by verticillium wilt were widely separated but several cases were observed in row plantings where the fungus killed the trees in order, most often in or on the margin of wet lands. Infections of aerial parts were in evidence as well as those of roots. Verticillium wilt was considered the most important elm disease in Massachusetts until lately when it seems to be secondary to Cephalosporium wilt.

Cephalosporium sp. Cephalosporium wilt and dieback is becoming more prevalent in New England and seems to be one of most serious concern since it has been reported to have killed a large tree in three to four years. Young trees, limbs, and twigs die rapidly after infection.

Phomopsis oblonga Sacc. (Diaporthe eres Nke, P. eres Sacc.). Phomopsis canker. This fungus attacks both the American and the Camperdown elms. Greatest injury is often caused to the Camperdown elm, some of which lost one-third of their branches during one year. Phomopsis caused "umbrella elms" to appear unsightly. Some small trees planted in cemeteries succumbed in three years.

Only the alpha type of spores were commonly observed in cultures isolated from the American elm while both alpha and beta spores were often present in cultures from the Camperdown elm. Nursery stock and young transplantations of elms under observation seemed to be most injured by this fungus.

Sphaeropsis ulmicola Ell. and Ev. Die-back. Canker. This dieback was observed on shade and forest trees, nursery stock, and young transplantings. The mottled cankers on the stems and the dead tips of twigs bearing the fungous fruiting bodies in April were definite symptoms.

Nectria spp. Nectria canker. Dead twigs bearing the characteristic red stromatic bodies were prevalent on elms. Apparently, this fungus is parasitic on weakened elms, more especially those affected by excessively low temperatures.

Cytospora carbonacea Fr. (Not Cytospora ambiens Sacc. according to descriptions). Cytospora canker. The fungus fruited on dead elm twigs collected during the spring and incubated in a moist atmosphere at room temperature, and on sterile sections of elm wood implanted in agar. Several cultures contained a Phomopsis.

Pleurotus ulmarius Bull. White sap rot. This fungus was present in 10 per cent of the cultures isolated from the trunks of dead elms.

Polyporus conchifer (Schw.) Fr. Twig rot. Numerous dead American elm branches varying from 0.4 to 2 inches in diameter bore sporophores of this fungus, sometimes as many as 40 attached to one twig. Only one of ten inoculations produced infection after incubating in the host for three months. The fungus is apparently only weakly parasitic.

Gnomonia ulmea (Sacc.). Thuem. Black leaf spot has caused premature defoliation of shade and forest elms throughout this State. The disease is always prevalent but defoliation is more complete in some seasons than others. Since defoliation appears early in the autumn, caretakers generally associate it with natural leaf ripening, give it little or no attention and consider that it causes very little or no injury to the trees. However, it is to be noted that elm trees which have been prematurely defoliated by this disease produce a scantier foliage and shorter twig growth during the growing season following. This would seem to warrant the application of sprays as control measures.

Winter injury, winter kill. The writer feels that winter injury has been given insufficient attention. Weak fungous parasites which follow winter injury and associated insects are often reported as the cause of the trouble. Vigorous trees in good soil protected from the severe north winds were seldom killed by the extremely low temperatures during the winter of 1933-34.

The loosening of the bark over fairly large areas, darkened water-soaked appearance of the sapwood, new layers of wood forming under the bark but dying prematurely in summer, necrotic twig tips and buds, paucity of foliage, dead limbs often bearing a few living branches with leaves, "leaf burn" as if improperly sprayed, complete necrosis during the second or even the third growing season following winter injury, are some symptoms worthy of note.

There were elms showing various forms of winter kill which were identical with those shown in some old Baldwin apple orchards where nearly all the trees died. Some of these elms died during the following summer but most of them bore scant foliage which often wilted on hot summer days. The heads of the trees often bore numerous, small, dead twigs.

"Owls eye canker." Cause indefinite. A canker which varies from a few inches in diameter when located on small limbs to 2 feet when on trunks is prevalent on elms throughout Massachusetts. Trees with these cankers bear scant foliage, grow very slowly, and have many dead branches. They are poor shade trees and often afford a

hazard to traffic especially when the heartwood is rotted and the trunk weakened. Eighteen of these large cankers were counted on the trunk of one elm tree which tree surgeons were removing in Salem. The cankers are elliptical with the major axis extending parallel to the trunk axis and the surface shows several successive, concentric layers of discolored dead wood.

Isolations from tissues in and around these cankers have failed to produce one fungus consistently. Species of Verticillium, Nectria, and Cytospora (Valsa) are most often associated.

Fusarium sp. This pink fungus was often isolated from dead twigs of elms. It was generally associated with other fungi.

MAPLE. ACER SPP. Verticillium sp. Verticillium wilt. Verticillium is the most important fungous parasite of maples in Massachusetts. Some of our old historical maples which are highly prized and cherished wilt and die during each midsummer. Wilted trees have been located in fields, pastures, margins of woodlots, city streets, parks, and private estates. Three cases have come under observation where two to four maples planted along one underground drainage line were killed by this fungus. Maples are often killed in order when planted closely in rows. The error is often made of replacing these maples with young trees of the same kind.

Nectria spp. Nectria canker and twig blight is becoming more prevalent in the twigs especially of Norway, Japanese, and sugar maples (A. platanoides, A. palmatum, A. saccharum). Dead limbs bearing fruiting bodies are prevalent.

Rhytisma acerinum (Pers.) Fr. and R. punctatum (Pers.) Fr. Tar spots are common especially on some upland forest species such as A. rubrum and A. spicatum which are sometimes prematurely defoliated by tar spot. Scattered specimens of A. saccharum infected with R. punctatum have been observed.

Gloeosporium spp., anthracnose, leaf blotch. Some form of anthracnose has been observed on each species of maple. During wet seasons it often caused 20 per cent defoliation of A. saccharum.

Phyllosticta minima (Berk. & Curt.) Ell. & Ev. Leaf spot. During 1931-32, leaf spot was very common but during the dry season of 1933 it seemed to have been checked. A. saccharum and A. palmatum were most affected.

Fomes applanatus (Pers.) Gill. white streaked rot. F. fomentarius (L.) Gill, white sapwood rot. F. igniarius (L.) Gill, white heart rot. These three woodrotting Fomes caused considerable damage to the wood in old trees with neglected wounds. One tree bears 13 sporophores of F. fomentarius and is under consideration for removal.

Leaf scorch due to weather conditions was very prevalent especially during the hot summer of 1933 when some maples lost more than 25 per cent of their leaves.

Frost cracks, slime flux, and leak. The so-called frost cracks were observed in several specimens by the writer who believes that these large cracks in the trunks of maples are due to causes other than frost. Several cases of slime flux and sap leak have been under observation. No direct evidence of harm to the trees has been observed but the flux is composed of bacteria, yeasts, and mycelium. Fungi isolated from the slime flux included: Fusarium, Verticillium, Gloeosporium, Nectria, Trichoderma, Fusicoccum (Cytospora ?), Sphaeropsis, Pythium, and several species of Mucorales and Hyphomycetes.

WILLOW. SALIX SPP. Fusicladium saliciperdum (All. and Tub.) Lindr. Scab, dieback, and twig blight. This disease has been under observation about eight years. It does not seem to be so prevalent now as it was during 1930. On some estates the death of willow trees was attributed to scab but these trees had been defoliated several times by leaf skeletonizing insects. No definite case where this fungus has killed willow trees has been observed. It has caused premature defoliation and twig injury, however. The first attack comes in June and causes willows to appear unsightly since they bear black twig tips with dead leaves attached. Not all species of willows are severely injured; ornamental varieties of golden, weeping, and crack willows appear most susceptible. The most susceptible species observed was Salix blanda.

Cytospora chrysosperma (Pers.) Fr. (Valsa ?). Canker and twig blight. This fungus was consistently isolated from cankers on the trunks and limbs of Salix fragilis growing by a stream. Considerable damage to the small branches and boles of these trees was observed. It appeared to be more prevalent during the past three years.

Marssonina populi (Lib.) Mag. Leaf spot and twig blight. An outbreak of this fungus occurred in the spring of 1935. A bushel of dead infected twig-tips was removed from the lawn under half the head of a tree of Salix fragilis. This fungus has spread among native willows at a rapid rate during the last two years. Up to this time it has not been collected on exotic Salix species.

Gloeosporium salicis West. Anthracnose, leaf and twig blight. Anthracnose is prevalent and the fungus is often associated with scab but it appears later in the season and is more active than scab. The same species of willow were susceptible to both diseases.

Uncinula salicis (D.C.) Wint. Powdery mildew. In September, mildew is especially prevalent on leaves of Salix fragilis and forms abundant perithecia. It seems to do little damage even to the leaves

on young trees.

Daedalea confragrosa (Bolt.) Pers. Heart rot. This wood-rotting fungus often forms its thin, chocolate-colored sporophores on Salix fragilis and S. amygdaloides. It rotted the wood of weakened trees and cuttings of large limbs driven in wet soil for rapid propagation for soil erosion projects.

POPLAR. POPULUS SPP. Cytospora chrysosperma (Pers.) Fr. Canker. Cytospora was prevalent on ornamental species and varieties of poplar: Populus alba, bolleana or Turkish poplar; P. nigra italica, Italian or Lombardy poplar; P. deltoides; P. grandidentata; P. tremuloides.

Dothichiza populea Sacc. & Briard. Dothichiza canker. This fungus is considered the most injurious fungous parasite of Chinese, Turkestan, and Italian poplars. It often kills whole rows of transplantings for the fungus is most injurious to young trees weakened by transplantings. Italian and Turkestan poplars seldom live more than ten years before their removal is advisable. The dead limbs and asymmetrical heads of these normally beautiful trees make 90 per cent of them unsightly.

Phomopsis sp. Phomopsis canker. A Phomopsis appeared in cultures from two different sources. It was associated with Cytospora and Dothichiza cankers.

Fomes igniarius (L.) Gill., F. fomentarius (L.) Gill., F. applanatus (Pers.) Gill., Hypoxylon pruinatum (Klot.) Cke., Schizophyllum commune Fr. Wood rotting fungi. Sporophores of these wood-rotting fungi have been commonly observed on poplars but fewer specimens have been collected during the past two years in which there were exceptionally long, dry periods in summer. The wood is very rapidly decayed by these fungi.

BIRCH. BETULA SPP. Polyporus betulinus (Bull.) Fr. Powdery sapwood rot. The most destructive disease of Betula populifolia is this sapwood rot. The injury to standing timbers, cordwood, and structures will total thousands of dollars. On account of this rot ornamental structures made from gray birch are worthless after standing unprotected for two years, and cordwood, for one year.

Nectria spp. Nectria canker is becoming more prevalent in all birches, especially B. populifolia and B. lutea. In one gray birch stand, 10 per cent of the matured tree trunks bore Nectria cankers as diagnosed by culturing.

Phomopsis sp. Bark canker. The long orange cirri from some pycnidia contained only spores of the alpha type while those from other pycnidia were of the beta type. The latter type was associated

with dry wood. The surfaces of leaf scars on matured trunks bore 12 orange-red cirri per square inch of surface. The inner bark and adjoining sap wood of Betula populifolia was rotted. The necrotic condition of the limbs was attributed to this fungus.

Merulius tremellosus Schräder. Sap and heart rot. Several dead trees of B. lutea bore two to four sporophores of this fungus located within six feet from the soil and generally near a wound or area with dead bark. Specimens were also observed near Lynn, Andover, and Concord.

OAK. QUERCUS SPP. Strumella coryneoidea Sacc. & Wint. Canker. This canker is becoming more prevalent. In one stand of mixed hardwoods, 2 per cent of the black oaks were infected with this fungus. It caused stunting of the growth, twisting of the tree, and formation of water sprouts below the cankers. Necrosis was also observed in about one per cent of the diseased trees.

Gnomonia veneta (Sacc. & Speg.) Kleb. Anthracnose. This disease is prevalent and causes more injury after a severe winter.

Taphrina caerulescens (Mont. & Desm.) Tul., leaf blister, and Diplodia longispora Cke. & Ell. twig blight. Heavy infection has been observed by Dr. O. C. Boyd.

Armillaria mellea Fr. Shoe string rot. Only a few sporophores have been seen each year.

Fomes applanatus (Pers.) Gill., F. fomentarius (L.) Gill., F. igniarius (L) Gill., Daedalea quercina, Polyporus sulphureus (Bull.) Fr., and Stereum sp. commonly cause rotting of oaks.

PINE. PINUS SPP. Capnodium pini Berk. & Curt. (?). Sooty mold was observed at seven stations and affected young trees of Pinus strobus adversely, for wherever the black sooty masses of mycelium were located, the leaves and twigs died.

Lophodermium pinastri (Schrad.) Chev. Needle cast is prevalent during some years on Pinus strobus and P. rigida.

Cronartium ribicola Fisch., C. comptoniae Arth., Coleosporium solidaginis (Schw.) Thuem. Rusts, except the white pine blister rust, do not cause much injury.

Dasyscypha ellisiana (Rehm) Sacc. In April 1934, Dr. T. T. Ayers called my attention to this fungus which was common on the trunks of P. strobus.

SPRUCE. PICEA SPP. Cytospora sp. Twig blight. This fungus was present in limbs of trees of Picea excelsa and P. pungens growing under adverse conditions. Injury is not serious in healthy trees.

HEMLOCK. TSUGA CANADENSIS. Melampsora abietis-canadensis (Farl.) Lund. Rust. One tree infected with this rust has been observed in the Berkshire Hills.

BASSWOOD. TILIA AMERICANA. Nectria ditissima Tul. Nectria canker is not prevalent but specimens can be found with little effort.

Gloeosporium tiliae Oud. Anthracnose was observed in isolated places and mostly in forest stands.

Pholiota adiposa Fr. Brown mottled rot. Sporophores of this fungus have been collected on rotting forest trees.

ASH. FRAXINUS AMERICANA. Septoria fraxini Desm. Leaf spot and twig blight. Dead twigs collected from ash trees bore pycnidia of this fungus in abundance.

Puccinia peridermiospora (Ell. & Tr.) Arth. Rust. Only one collection has been made on this host. Arthur Harrison called my attention to it.

Gloeosporium aridum Ell. & Holw. Anthracnose is prevalent during some seasons.

Fomes fraxinophilus (Pk.) Sacc. White heartwood rot. Several collections have been obtained annually from forest trees.

BEECH. FAGUS SPP. Nectria sp. Nectria canker. A constant search was made for Nectria cankers on beech but none were found until after the extremely cold winter of 1933-34. During the summer of 1935, the writer gathered from one beech tree 41 dead twigs and limbs bearing stromata of Nectria. Very few shade trees are free from this fungus in that vicinity. The fungus has spread rapidly during the past two years and the writer considers this condition serious especially with respect to the purple varieties.

SHRUBS

AZALEA AND RHODODENDRON. Sporocybe azaleae (Pk.) Sacc. Bud and twig blight. This fungus has caused considerable damage in the Connecticut Valley as it killed 50 per cent of the flower buds and sometimes the whole plant.

Phomopsis sp. Stem blight. A Phomopsis has been consistently isolated from dead stems of azaleas and is considered cause of necrosis.

Verticillium sp. This fungus has been cultured from seven dead azaleas.

JAPANESE BARBERRY. BERBERIS THUNBERGII. Phoma berberina Sacc. Fruit rot. Occurred in cultures from dead barberry twigs and common in rotted berries during the autumn of 1933.

Verticillium sp. Sometimes cultured from the stems of wilted and dead plants.

CHINQUAPIN. CASTANEA PUMILA. Endothia parasitica (Murr.) Ander. & Ander. Blight. Blighted and killed shrubs have been noted.

DOGWOOD. CORNUS SPP. Phoma corni Fckl. Canker. Prevalent on young, dead twigs of Cornus paniculata, 1934.

Botrytis cinerea Auct. Am. Botrytis blight. The buds of Cornus florida and fruits of C. paniculata were heavily infected with this fungus.

HONEYSUCKLE. LONICERA TATARICA. Phoma mariae Clinton. Twig blight. An outbreak of this disease was observed during the autumn of 1934. Most of the infected twigs died during the summer of 1935 and the disease continued to spread.

Fusarium sp. Bark blight. Five shrubs in a row died and numerous pink areas bearing Fusarium-like conidia were found on the bark of each shrub, especially at the nodes. The symptoms were similar to those caused by Hypomyces on Staphylea.

AMERICAN BLADDER NUT. STAPHYLEA TRIFOLIA. Hypomyces ipomoea (H.) Wr. Twig blight. This fungus causes necrosis of young twigs.

Coryneum microstictum B. & Br. Corynose twig blight. There is less injury than in former years.

SNOWBERRY, SYMPHORICARPOS ALBUS. Botrytis sp., Alternaria sp., Glomerella rufomaculans, Penicillium sp. These fungi continue to rot the berries and make them unsightly. The October beauty of this shrub is lost in this region.

WINTER INJURY AND WINTER KILL

The winter of 1933-34 was extremely cold for this region and temperatures varying from -20° to -40° F. were reported. The average temperatures for the two preceding winters were above normal. A reasonably accurate survey of the damage due to these low temperatures

could not be made until the close of summer of 1935, since weakened plants were required to withstand the dry summer season of 1934, and the winter of 1934-35. Some of the cultivated plants were killed, others had all aerial parts exposed to the low temperatures killed, while some had only buds or portions of the twigs killed. Stem parts covered with snow generally survived. Figures in the following list indicate the estimated percentages of individuals or their parts that were killed:

Apple		Forsythia	
Baldwin	10-90%	Flower buds	95%
Bechtel's Crab	20	Twigs	20
Berries		Grapes	
Strawberries	20	Brighton	75
Blackberries	40	Delaware	20
Raspberries	40	Niagara	25
Bittersweet	10	Hawthorn	
		English	50
Cherries		Native species	10
Red, sweet	80		
Black, sweet	80	Ibota privet (Ligustrum ibota)	
Flowering	20	Twigs	95
Deutzia	90	Magnolia	10
Dogwood, flowering		Peaches	75
Flower buds	90	Buds	99
English ivy	30	Roses	
		Pillar, stems	75
Flowering almond	30	Tea, stems	10
		Sassafras	
		Twigs	30